PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements relating to Centrifugal Abrasive Projecting Machines

We, THE AMERICAN FOUNDRY EQUIPMENT COMPANY, a corporation organized under the laws of the State of Delaware, United States of America, of 400, Byrkit Avenue, Mishawaka, Indiana, United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to an improved centrifugal abrasive projecting machine designed to throw abrasive in a directed stream at velocities effective to clean the surfaces of castings, forgings, bars, sheets and like metallic objects so as to remove encrusted sand and scale from the surface thereof.

Centrifugal abrasive projecting machines now in use comprise a rotor head mounted for rotation at high speeds having a plurality of abrasive projecting blades mounted thereon which extend inwardly short of the axis of rotation of the rotor head to provide a central abrasive receiving space. A normally stationary tubular control member extends into the said central space and is provided with a discharge outlet in the tubular sidewall thereof. An impeller comprising a plurality of spaced abrasive propelling vanes is positioned within said control member and is fixed to rotate with said rotor head. Abrasive supplied to said propeller by a feed pipe is thrown by the impeller vanes outwardly through the discharge outlet in the tubular control member, where it is picked up by the inner ends of the rotating blades and thrown against the work piece to be cleaned or treated.

It will be appreciated that in a structure of the type above described, operating clearances must be provided between the rapidly rotating impeller vanes and the normally stationary tubular control member within which the propeller vanes are positioned. Abrasives normally used for blast cleaning and treating of metal objects comprise such material as hard quartz sand, steel grits or shot, which materials are free-flowing. Such abrasive materials having a relatively high specific gravity, are violently affected by centrifugal forces acting upon them, and due to their flow characteristics are to a certain extent affected by air currents promulgated by the fan action of the rapidly rotating impeller vanes and projecting blades.

A small but nevertheless highly objectionable percentage of the abrasive material fed into the impeller and tubular control member of present centrifugal abrasive projecting machines will not be discharged by the impeller vanes through the discharge outlet in the tubular control member, but will flow or move rearwardly through the clearance space provided between the impeller vanes and the tubular control member, which uncontrolled abrasive is commonly designated as stray abrasive. This stray abrasive continues its irregular movement through this clearance space, rebounding between the rotating neck portion of the impeller at the rear of the impeller vanes and the stationary tubular control member, where it exerts a grinding wear upon the adjacent stationary and moving parts of the machine.

It has heretofore been attempted to reduce the quantity of stray abrasive moving rearwardly of the rotor by the provision of a circular rim or flange extending inwardly from the inner end of the tubular control member, which flange seats behind the impeller vanes. It will be appreciated that, operating clearances must also be provided between the inner edge of this flange and the neck portion of the rotating impeller. It is therefore impossible to completely seal this clearance space between the rotating impeller and the stationary tubular control member with any mechanical element so as to prevent the rearward movement of this stray abrasive.

The stray abrasive lodging between the normally stationary tubular control member and the rotating parts of the propeller eventually escapes by passing around the inturned flange of the tubular control member, where centrifugal force acts upon the freed stray abrasive to cause it to fly outward. This outward flying

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abrasive, free of the tubular control member, is picked up by the abrasive propelling blades and is thrown helter-skelter in all directions. This uncontrolled stray abrasive has a severe abrading action, due to the velocity imparted to it by the rotating blades, with the result that it wears the protective casings and other mechanisms surrounding the rotor, without necessarily coming into cleaning contact with the work piece positioned at one side of the rotor. It will also be appreciated that this stray abrasive is broken up and damaged without doing any useful work, but actually doing destructive work. This stray abrasive, free of the tubular control member, is often thrown against the rotor head during its outward movement, with the result that the adjacent rotor head and other parts of the machine are also abraded thereby.

It will also be appreciated that the flange portion extending inwardly from the inner end of the tubular control member must also be accurately centered with respect to the neck portion of the rotating propeller and must also be properly spaced between the adjacent impeller vanes and the rear wall surface of the rotor head to provide proper operating clearances between these points. When the impeller is in position, it is difficult, if not impossible, to visually determine whether proper axial and lateral clearances are provided between the normally stationary inturned flange of such a tubular control member and the rotating parts of the mechanism. When the tubular control member is improperly positioned, there is further severe grinding between the stationary and moving parts. It will also be appreciated that such tubular control member cannot be removed from the machine without first removing the impeller so that considerable time is required in adjusting, removing and replacing worn operating parts.

It is the primary object of this invention to improve upon centrifugal projecting abrasive machines now in use so as to obtain improved directional firing qualities and operating efficiencies and to relieve operating parts of the machine from damaging wear caused by stray abrasive.

In the accompanying drawings:

Fig. 1 is a side elevational view of the improved abrasive throwing wheel showing the supporting brackets for adjustably mounting the feed spout and tubular control member;

Fig. 2 is a vertical cross-sectional view of the abrasive throwing wheel, showing certain details of the improved tubular control member and impeller with abrasive and air vent passages in the hub of the wheel, this view also showing in section the supporting brackets upon which the feed spout and tubular control member are adjustably supported, this view being taken on line 2—2 of Fig. 1;

Fig. 3 is a cross-sectional view of the abrasive throwing wheel and associated tubular control member and impeller, taken along a plane at right angles to the axis of rotation of the wheel and looking in the direction of the arrows 3—3 of Fig. 2;

Fig. 4 is a rear face view of the wheel showing particularly the vent passages in the hub as they appear when looking in the direction of the arrows 4—4 of Fig. 2;

Fig. 5 is an enlarged fragmentary cross-sectional view through the tubular control member and impeller, a fragmentary portion of the tubular control member being broken away to more clearly show the vent passages in the hub, this view being taken along lines 5—5 of Fig. 2;

Fig. 6 is a perspective view of the abrasive impeller, the impeller being positioned centrally of the rotor when assembled thereto;

Fig. 7 is a side elevational view of the tubular control member, certain parts thereof being broken away to more clearly illustrate the interior construction thereof;

Fig. 8 is a transverse cross-sectional view of the hub as it appears when removed from the wheel, and when looking at a section thereof in the direction of the arrows 8—8 on Fig. 2;

Fig. 9 is a top plan view of the feed funnel, feed pipe and supporting bracket as it appears when looking in the direction of the arrows 9—9 on Fig. 1;

Fig. 10 is a cross-sectional view taken at the juncture of the feed funnel and the feed spout looking in the direction of the arrows 10—10 of Fig. 1;

Fig. 11 is a cross-sectional view of the feed spout and supporting bracket therefor, this view being taken on line 11—11 of Fig. 1;

Fig. 12 is a cross-sectional view through a portion of the tubular control member and its supporting bracket, this view being taken along line 12—12 of Fig. 1; and

Fig. 13 is a side elevational view of the feed spout and control cage supporting bracket.

Similar reference characters refer to similar parts throughout the drawings and specification.

Referring more particularly to Figs. 1 to 4 inclusive of the drawings, the improved centrifugal abrasive projecting machine comprises a rotor structure W

supported by a hub *h* carried by a shaft 21 adapted to be rotated at high speed. The rotor W comprises more particularly a side wall plate 1 of generally circular form upon which is rotatively supported a plurality of generally radially extending abrasive propelling blades *b* which extend inwardly short of the axis of rotation to define a central space 8 which receives a tubular control member *c*. An impeller member *i*, which may be formed as a one piece casting, is positioned within the tubular control member *c* and is fixed to the hub *h* so as to rotate therewith. An abrasive supply conduit *f* is provided which is arranged in inclined position to feed the abrasive into the impeller member *i*.

The blades *b* may be conveniently mounted upon the rotor plate 1 by providing a second rotor plate 2 spaced from the rotor plate 1, which plates are connected at suitable intervals by studs 3 having reduced ends 4 which extend into openings bored in the rotor plates 1 and 2. It will be noted that the studs 3 are provided with shoulders 5 against which the plates 1 and 2 seat so as to hold them in fixed spaced relation, the studs 3 being permanently connected with the plates 1 and 2 by welding 6 at the reduced ends 4 of the studs 3.

It will be noted, by referring to Fig. 2, that both the rotor plates 1 and 2 are each provided with a central opening 7, whose peripheral edges are generally in axial alignment with the interior ends 12 of the blades *b*, thus providing a truly circular central space 8 within which the tubular control member *c* is received. By referring more particularly to Figs. 2 and 3 it will be noted that the rotor plates 1 and 2 are also provided with a plurality of radially extending grooves 9 which are arranged in pairs so as to receive the respective adjacent side edges of the blades *b*.

The blades *b* are preferably made of a metallic material which is resistant to abrasive wear and is sufficiently tough and strong to stand up under the shocks incident to operation. Each of the blades *b* comprise generally a bottom wall portion 10 which may be of increased thickness at the outer end 13 thereof and which tapers to an edge at the inner end 12 thereof as shown in Fig. 3. Side flanges 11 extend along each side edge of the blade which are preferably of uniform height throughout so as to rather snugly fit within the grooves 9 provided in the rotor plates 1 and 2. Each blade *b* may be held in fixed operative position by a threaded set screw 15 which extends through a threaded aperture in the rotor plate 2 and which is provided with a tapered inner end 16 which seats within a half conical groove 14 provided on the rear face of the blade *b*. The outside face of each set screw 15 when in operative position is substantially flush with the outside face of the rotor plate 2, and may be provided with a tool engaging slot 17 into which a screw driver or other tool may be inserted to manipulate the set screw. It will be appreciated that the blades *b* may be quickly and easily removed by partially withdrawing the set screw 15 so as to permit the blades *b* to slip out through the periphery of the rotor. The blades however are fixedly held in secure operative position when the set screw 15 is turned inward so that the conical end 16 seats within the half conical recesses 14 in the blade. All of the blades *b* of the rotor may be similar in construction and similarly mounted.

The hub *a* may be made from a single casting comprising a sleeve portion 20 and a heavy flange portion 20*a* which has a large central bore into which the end of the drive shaft 21 snugly fits. The drive shaft 21 may be fixedly held to the hub *h* by one or more splines 22. As thus assembled, it will be noted that the interior end of the shaft 21 is visible through the central space of the rotor prior to the insertion of the impeller *i*. The hub *h* is secured to the rotor W by means of a plurality of spaced threaded bolts 23 which extend through the hub flange 20*a* and into threaded apertures in the rotor plate 1. A ring covering 24 of rubber or other abrasive-resisting material may be attached to the peripheral edge of the flange portion 20*a* of the hub so as to protect the flange portion from the abrading action of rebounding abrasives.

The control member *c* is tubular in cross-section and has a substantially cylindrical exterior surface. The control member is provided with an abrasive discharge outlet 32 of generally limited peripheral length. Assuming that the rotor shown in Fig. 3 is rotating clock-wise, the abrasive would be thrown out of the discharge opening 32 of the control member by the impeller *i* in a stream flowing somewhat to the right of the radial line. To facilitate ejection of the abrasive, a forward edge 34 of the discharge outlet 32 may be inclined as shown in Fig. 3, while the rear edge 33 of the outlet 32 may or may not be so inclined. If desired, the walls of the tubular control member may be slightly thickened at the point 34 which part normally receives the greatest wear. It will also be noted by referring to Fig. 2 that the side edges 35 of the discharge outlet 32 reside slightly within

and between the inside faces of the flanges 11 of the blades. If desired, the inside faces of the flanges 11 of the blades adjacent their inner ends may be tapered inwardly as at 18 to assist in guiding the abrasive from the discharging outlet 32 on to the bottom wall portion 10 of the blade.

It will be noted by referring more particularly to Fig. 2 that when the tubular control member *c* is in operative position, the interior end 36 thereof extends into a circular recess 29 provided in the hub *h*, such clearance being provided to permit free rotation of the hub *h* while the tubular control member *c* remains stationary. Leading outwardly from the circular recesses 29 in the flange portion 20*a* of the hub *h*, is a plurality of vent passages 25. As will be more fully brought out hereafter, the circular recess 29, in which the interior end 36 of the tubular control member *c* extends, is adapted to receive any stray abrasive that may work its way rearwardly of the rotor, this abrasive then being promptly ejected through the vent passages 25. It will be noted that the vent passages are relatively close to the shaft 21 and the axis of rotation of the rotor so that any stray abrasive that may be ejected from the vent passage 25 has no substantial abrading velocity and consequently does little or no damage to the surrounding mechanism.

While I have shown a vent passage 25 for each blade of the wheel, it will be appreciated that any number of vent passages may be provided. Each vent passage 25 is defined by a lower wall 26 and a top wall 27 and substantially parallel side walls 28. The top wall 27 and the bottom wall 26 flare apart outwardly so that the opening of the passage 25 is larger at the discharge end than at the end where it leads into the circular recesses 29. The circular recesses 29 may be cut out or depressed at points 31 adjacent each vent passage 25, as shown particularly in Figs. 5 and 8, so as to further facilitate the outflow of stray abrasive through the vent passages.

The upper portion of the tubular control member *c* may be cut away at the point where it emerges beyond the rotor disk 2 so as to provide entrance room for the discharge end of the feed pipe *f*. The lower half portion of the tubular control member *c* may be provided with an outwardly extending arcuate foot or saddle portion 37 which provides means for rigidly securing the tubular control member to a suitable support.

The tubular control member *c*, feed spout *f* and feed funnel 72 may be rigidly but adjustably supported upon a suitable support which will now be described. A fixed and rigidly mounted platform positioned in front of the rotor, supports the bracket structure. This platform may comprise a heavy angle iron having a generally horizontal extending support flange 51 and a downwardly extending stiffening flange 50. A flat plate 51*a* may also be positioned upon the horizontal flange 51 to provide a smooth and level seat for a main supporting bracket 52, which bracket comprises an upwardly extending flange portion 53 and a horizontal extending foot portion 54 which sets upon the plate 51*a*, a stiffening web 55 joining the flange portion 53 to the foot portion 54. As shown more particularly in Figs. 1, 12 and 13, a pair of bolts 56 are provided which extend through elongated slots 56*a* in the foot portion 54 of the bracket and through circular openings in the plate 51*a* and flange 51. Thus the foot portion 54 of the bracket may be moved a certain amount to the right or left as shown in Fig. 1 for a purpose which will hereafter be brought out.

The tubular control member is supported upon an arcuate shaped saddle 60 which is connected to flange 53 of the main bracket 52 by a secondary bracket 57. The secondary bracket 57 is provided with a vertically extending leg portion 58 which seats against the flat face of the flange 53 on the main bracket, bracket 57 being held thereto by a pair of spaced bolts 59 as shown in Fig. 11 which extend through horizontally elongated slots 59*a* provided in the leg portion 58 and through vertically elongated apertures 53*a* in the flange portion 53 of the main bracket. The secondary bracket 57 is provided with a horizontally extending leg portion 61 which is also provided with horizontally elongated slots 62*a* through which bolts 62 extend, the bolts 62 extending through circular apertures in the handle portion 63 of the saddle 60.

Referring more particularly to Figs. 1, 2 and 12, it will be noted that the saddle 60 is provided with a generally arcuate surface 64 which extends under the saddle portion 37 of the tubular control member *c* and generally conforms to the circular contour thereof. A clamping bar 65 has an arcuate foot portion 66 which rests upon the saddle 60 and an arcuate belly portion 66*a* which extends into the saddle portion 37 of the tubular control member *c* and conforms generally to the contour thereof. A clamp bolt 67 extends through a circular aperture 70 in the clamping bar 65 and the head 68 of the bolt is of such size as to be insertable through an enlarged opening 69 in the saddle 60. When the clamping bar 65 with associated

bolt 67 is pushed forwardly toward the rotor disk 1, the bolt head 68 slides into a bayonet slot 69*a* and in this position the nut on bolt 67 can be tightened to firmly clamp the clamping bar 65 in fixed position. Removal of the clamping bar 65 can be effected by loosening the nut and the clamping bolt 67 sufficiently to permit outward withdrawal of the clamping bar 65 to the point where the head of the bolt 68 will slip through the enlarged opening 69 in the saddle 60.

Abrasive is supplied to the impeller *i* and the tubular control member *c* through a feed spout *f* upon which is mounted a feed funnel 72 as shown more particularly in Figs. 1, 2 and 9. The feed funnel 72 is provided with a secondary supporting bracket 73 and is supported on the main bracket in a fixed adjustable relation to the cage and impeller as indicated by numerals 74 to 82 inclusive, and shown in Figs. 1, 2, 10 and 13 of the drawings.

The impeller *i* may be made as a single casting preferably of some wear-resistant metal and is cast in the form shown in Fig. 6. The impeller generally comprises a circular rim or front wall portion 85 defining a central opening 88 and a circular rear wall portion 86 between which are supported a plurality of spaced radially extending impeller vanes 87. As shown in Fig. 6 the impeller vanes 87 may be cast integrally with the front wall portion 85 and the rear wall portion 86. As shown in Fig. 2 the axial length of the vanes 87 is preferably slightly less than the space between the side edges 35 of the discharge outlet 32 in the control member *c*. The inner ends of the vanes 87 extend short of the axis of rotation of the rotor to define a center abrasive receiving opening 83 which is generally in line with the discharge outlet of the feed conduit *f*.

The rear wall portion 86 of the impeller is provided with a collar portion 88*a* extending rearwardly thereof which collar portion terminates in outwardly extending flange portion 89 which seats against the inside face of the hub member *h*. The collar portion 88*a* has an axial length sufficient to properly space the impeller vanes 87 so that the impeller vanes will properly discharge the abrasive in a radial direction through the discharge outlet 32.

The impeller *i* is fixedly secured to the inner end of the drive shaft 21 by means of a threaded bolt 92 which has a head 92*a* seated within a depressed recess 90 formed centrally of the rear wall portion 86 of the impeller *i*. By referring to Fig. 2 it will be noted that when the threaded bolt 92 is in proper position the top face of the head 92*a* of the bolt is substantially flush with the inside face of the rear wall portion 86.

Preferably it is desirable that impeller vanes 87 equal in number to the abrasive-throwing blades *b* be provided, as illustrated more particularly in Fig. 3. The advancing face of the impeller vanes 87 should be positioned slightly in advance of the advancing face 10 of the propelling blades *b* so that the abrasive thrown by the impeller vanes through the discharge outlet 32 in the control member will be deposited gently onto the inner end of the corresponding abrasive propelling blade. In order that the impeller *i* will be properly mounted so as to place the advancing face of the propelling vanes 87 in proper advanced position, the projecting end of the shaft spline 22 is arranged to extend into a corresponding slot provided in the inside face of the collar portion 88*a* of the impeller *i*, as illustrated in Figs. 2 and 6. The impeller *i* is assembled to the rotor by inserting the same into the tubular control member *c* and inserting the inner end of the shaft spline 22 into the corresponding slot provided in the collar portion 88*a* of the impeller *i*. The securing bolt 92 is then inserted into a threaded aperture in the end of the drive shaft 21 and tightened so as to hold the impeller flanges 89 in face-clamping engagement with the inside face of the hub member *h*. It will be appreciated that the impeller can be quickly removed by first removing the feed spout *f* by loosening clamping bolt 78 and then removing the impeller bolt 92.

Improved directional firing and lessened wear of the operating parts is effected by providing the interior surface of the tubular portion 30 of the control member with an internal helical rib 41 which may be cast integrally with the tubular control member, as shown more particularly in Fig. 7. This helical rib 41 extends from the free edge 36 of the tubular control member inwardly thereof to a plane intersecting the tubular control member at the rear side edge 35 of the discharge opening 32 and which plane is generally parallel to the rotor wall 1. It will be seen by referring more particularly to Fig. 7 that the rib 41 spirals approximately 3 turns beginning at point 42 at the rear edge 36 of tubular control member and ending at point 43 generally in the plane above-mentioned. Thus a helical passage 44 is provided around the inside face of the tubular portion 30 of the control member *c*, which passage is defined by adjacent rib portions 41, and returns stray abrasive to the plane opposite the discharge opening and the impeller blades.

Referring again to the impeller *i* as shown more particularly in Fig. 6, it will

be noted that the impeller is provided with a pair of diametrically spaced web portions 93 extending between the rear wall portion 86 of the impeller and the rear flange portion 89 thereof. Assuming that the impeller is rotating in the direction of the arrow shown in Fig. 6, the advancing face 94 of the web portions 93 function as a fan. Any stray abrasive not immediately discharged through the discharge opening 32 of the control member and which works its way rearwardly between the inside face of the tubular control member and the rear wall portion 86 of the impeller as through the space marked *x* will find itself lodged within the passage 44 between adjacent rib portions 41 of the tubular control member. As the impeller *i* rotates, the web portions 93 will create an air current which will drive the abrasive through the passage 44 in the direction of the arrow as shown in Fig. 7 and back out through the space *x* between the rear wall portion 86 of the impeller and the inside face of the tubular control member where it can be again picked up by the impeller vanes 87 and hurled out through the discharge outlet 32 of the tubular control member. The rotating web portions 93 also create an air stream which flows axially outward towards the feed spout *f* and this moving current of air to a substantial extent prevents the entry of abrasive into the space *x*.

Thus the helical passage 44 and the web portions 93 both cooperate to insure that all of the abrasives, except a small quantity of fines and a few particles, fed into the impeller *i* is thrown out through discharge outlet 32 of the control member and will be deposited on the inner ends of the advancing blades at a predetermined point during rotation thereof.

When the abrasive ejected through the discharge outlet 32 is deposited upon the inner end of the blades at a predetermined point only, the abrasive will be thrown in a predetermined direction, depending upon the clock dial position in which the discharge opening 32 is placed.

Abrasive fines and other abrasive which normally tends to creep rearwardly of the rotor between the impeller and the tubular control member is largely prevented from such movement by the air stream created by the fan action of the web portions 93. If any such abrasive fines or other abrasive does move rearwardly through the space *x* between the impeller *i* and the tubular control member *c*, it is guided back into the path of rotation of the impeller vanes 87 by the helical passage 44 through which it is driven by the fan action of the web portions 93.

Should any abrasive fines move rearwardly a sufficient distance so as to be unaffected by the air current created by the revolving web portions 93, it will then pass into the circular recess 29 provided in the hub member *h* and readily escape through the vent passages 25 at such low velocity as to have no abrading or damaging effect on surrounding mechanisms. The stray abrasive particles escaping through the vent passages 25 has been found to be substantially confined to dust particles which are not susceptible of being effectively thrown by the abrasive projecting blades *b*. It is believed that the air current created by the rotating web portions 93 causes the abrasive fines to stay within the groove 44 until discharged at the rear point 42 or front point 43 since numerous test runs clearly show that these stray abrasive fines exert no grinding or damaging effect upon either the impeller *i* or the tubular control member *c*. Consequently these parts will last indefinitely as far as any grinding action of stray abrasive is concerned. The tubular control member first wears out at points adjacent the discharge outlet 32 due to the abrading effect of the discharging abrasive contacting the surrounding edges of the opening 32. Stray abrasive fines escaping from the helical passage at point 42 are immediately discharged into the circular recess 29 in the hub from which point it is promptly ejected by vent passages 25. No stray abrasive can work its way around the inner end 36 of the control member and into space marked *y* since all the stray abrasive which reaches the circular recess 29 escapes through the vent passages 25.

It will be noted that the tubular control member *c* may be shifted the desired amount to the right or left as shown in Fig. 1 by loosening the bolts 62 and shifting the handle portion 63 of the saddle 60 to the right or left which is permitted by the horizontally elongated slots 62*a* in the horizontally extending leg portion 61. The tubular control member *c* may be shifted axially of the rotor so as to properly position the interior end 36 thereof in the circular recess 29 in the hub simply by loosening the bolts 59 and shifting the secondary saddle supporting bracket 57 to the right or left as shown in Fig. 2. The tubular control member *c* may be vertically raised or lowered by loosening the bolts 59 and shifting the bracket 57 in a vertical direction which is permitted by the vertically elongated slots 53*a* in the flange portion 53 of the main bracket.

Likewise the feed spout *f* and associated funnel member 72 may be shifted in six different directions. The flange portion

82 of the feed spout *f* may be shifted axially of the wheel toward or away from the circular rib 39 of the associated tubular control member by loosening the bolts 76 as shown in Figs. 1, 2 and 10 and shifting the downwardly extending leg portion 75 of the secondary bracket 73 to the right or the left as shown in Fig. 2. The discharge end of the feed spout *f* may be vertically raised or lowered by unloosening the bolts 76 and shifting vertical leg portion 75 of the secondary bracket 73 vertically which is permitted by the vertically elongated slots 53*b* provided in the flange portion 53 of the main bracket 52, which feature is more particularly shown in Fig. 13.

The discharge end of the feed spout *f* may be shifted laterally to the right or left as shown in Fig. 1 by unloosening the bolts 78 and then shifting the feed spout *f* laterally to the right or left as shown in Fig. 1 which is permitted by the elongated slots 77*b* provided in wing portions 77 extending laterally from the upper end of the feed spout *f*.

Thus it will be appreciated that the tubular control member *c* as well as the feed spout *f* and its associated funnel member 72 are both susceptible of a six-way adjustment so that these parts can be accurately centered and positioned for most efficient operation. The adjustment is effected by merely loosening paired clamp bolts, shifting the parts in the desired direction and the desired amount and then tightening the clamp bolts so as to accurately hold these parts in the desired fixed position to which they have been adjusted. Thus the tubular control member *c* may be adjusted upward or downward, to the right or left and axially in both directions so that the proper accurate clearance is provided between the interior ends 12 of the blades *b* and the outer surface of the tubular control member and further to position the interior end 36 of the tubular control member in proper position within the circular abrasive-receiving recess 29 in the hub member *h*. Likewise the discharge end of the feed spout *f* may be vertically adjusted, laterally adjusted to the right or left, and axially adjusted in both directions so as to properly center the outwardly extending flange portion 82 on the inner discharge end of the feed spout in proper position within the tubular control member *c* and in proper abutting relation to the circular rim 39 of the tubular control member.

It will be noted by referring to Fig. 1, that the bracket structure supporting the tubular control member *c* and the feed spout *f* are positioned off to one side from the axis of rotation of the rotor so as to give clear, unobstructed view of the control cage. The proper clearance between the outer surface of the control cage and inner ends of the blades *b* and the inner edges 7 of the side wall plates 1 and 2 of the wheel can thus be visibly determined and provided for. Clear unobstructed view is also provided for centering the flange 82 of the feed pipe in proper position within the tubular control member *c* and in proper abutting relation to the rib 39. The inner end 36 of the tubular control member may be inserted into the circular recess 29 in the hub *h* the proper axial distance by providing a mark on the outer surface of the tubular control member so positioned as to align with the outside face of the side wall plate 2 when proper axial insertion of the tubular control member *c* has been effected. Proper and accurate positioning of the tubular control member *c* and the feed pipe *f* with reference to the rotor *w* is thus assured.

It has been further found from tests made of the machine herein disclosed that the blades *b* wear with greater uniformity so that the blades and the rotor remain in dynamic balance until the face portion 10 of the blades are substantially entirely worn away.

Any stray abrasive fines which reach the circular recess 29 in the hub *h* is promptly discharged to the vent passages 25, and no abrasive works its way around the inner end 36 of the tubular control member and into the clearance space *y* between the outside surface of the tubular control member and the inner peripheral edge 7 of the side wall plate 1. Thus the side wall plate 1 of the rotor is subjected to little or no wear during operation.

It will be appreciated that when a bladed abrasive throwing wheel is rotated at blasting velocity, air disturbances necessarily result, causing air current movements within the central opening of the wheel, which, by reason of the high speed rotation of the blades, is a region of low pressure. Air flows into this central region through the feed spout or space surrounding the feed spout and the tubular control member which is all positioned on one side of the wheel, the rear side of the wheel in prior centrifugal wheels being closed at the back. By the provision of vents or bleeder passages 25 through which air can circulate freely either to enter the wheel or flow from the wheel to stabilize and balance the pressure within the central region of the wheel, greatly improved results in directional control efficiency and reduced wear are obtained, since the disturbing air currents

set up by the rotation of the bladed wheel are thus substantially obviated or the effect thereof greatly lessened.

With my improved centrifugal blasting machine as herein disclosed, actual tests have shown that little or no stray abrasive or abrasive fines are discharged from the vent openings, which is a further indication of the high directional control efficiency obtained. This highly desirable result appears to be attributable to the fact that the impeller webs 93 in cooperation with the helical passages 44 in the tubular control member prevent the rearward movement of stray abrasive or return such stray abrasive to the interior of the tubular control member, and to the fact that air is swept into the central region through the vents provided in the hub, which movement of air would act to prevent the rearward movement of the stray abrasive so that the abrasive is retained in such position within the tubular control member that it can readily be propelled out through the discharge outlet therein by the impeller. While the highly desirable results produced by my improved abrasive throwing machine have been conclusively proven by numerous tests, the theory of its operation and the movement of abrasive and air currents can only be conjectured, since it is almost impossible to measure same under high speed operating conditions.

It has been found further, and demonstrated to be a fact, that in my improved abrasive throwing machine the exterior of the tubular control member evidences little sign of wear in operation, and that in my improved device the tubular control member is subjected to less abrasive wear than the tubular control members in prior art devices. Any back-sweep or circular movement of abrasive-laden air around the exterior of the tubular control member appears to be eliminated, as evidenced by the fact that there is little sign of wear on the exterior surface of the tubular control member, and the abrasive moves with uniformity and free from undesirable air current disturbances and is directed from the discharge outlet of the tubular control member immediately and directly onto the inner end of the blades as they pass the discharge outlet.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. An abrading machine having a rotor with a plurality of blades terminating short of the axis of rotation of said rotor to define an abrasive admitting space, a tubular abrasive control member extending into said abrasive admitting space, said control member having an abrasive discharge outlet in the tubular side wall thereof operative to direct abrasive into the path of rotation of said blades and rotatably mounted impeller vanes positioned within said tubular control member operative to eject abrasive through said discharge outlet into the path of rotation of said blades characterized by this that a passage and a drive element are associated with the control member and impeller member respectively to move stray abrasive that finds its way past the abrasive discharge outlet back into position where it will be thrown by the impeller vanes through the discharge outlet.

2. Abrading machine as set forth in claim 1 wherein a helical rib is fixed to the inner portion of the control member to define a helical passage operative to return stray abrasive to a position where it may be discharged through said discharge outlet.

3. The abrading machine as set forth in claims 1 and 2 wherein the impeller member has a fan element associated therewith positioned rearwardly of the propelling vanes operative to create a current of air which resists movement of stray abrasive away from the impeller member and the discharge outlet.

4. An abrading machine as set forth in claim 1 in which a feed spout supplies abrasive to the control member and supporting means is provided for said feed spout positioned to one side of the feed spout and said tubular control member and comprising a main bracket and a saddle member adjustably connected to and extending laterally from the main bracket for adjustably supporting said feeding device above and below said tubular control member.

5. An abrading machine having a rotor with a plurality of blades terminating short of the axis of rotation of said rotor to define an abrasive admitting space, a tubular abrasive control member extending into said abrasive admitting space, said control member having an abrasive discharge outlet in the tubular side wall thereof operative to direct abrasive into the path of rotation of said blades and rotatably mounted impeller vanes positioned within said tubular control member operative to eject abrasive through said discharge outlet into the path of rotation of said blades characterized by a vent passage communicating with the interior of the control member and with the exterior of the hub of the rotor whereby the air pressure within the central region of the rotor will be

stabilized and balanced and stray abrasive material moving rearwardly beyond a given point can escape to the exterior.

6. An abrading machine as set forth in claims 1 and 5 wherein pockets are provided in the rotor head that open into the helical grooves in the control-member and a vent passage extends from each of said pockets to the exterior of the rotor heads.

Dated the 2nd day of October, 1939.

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201—6, Bank Chambers,
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Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1941.

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1

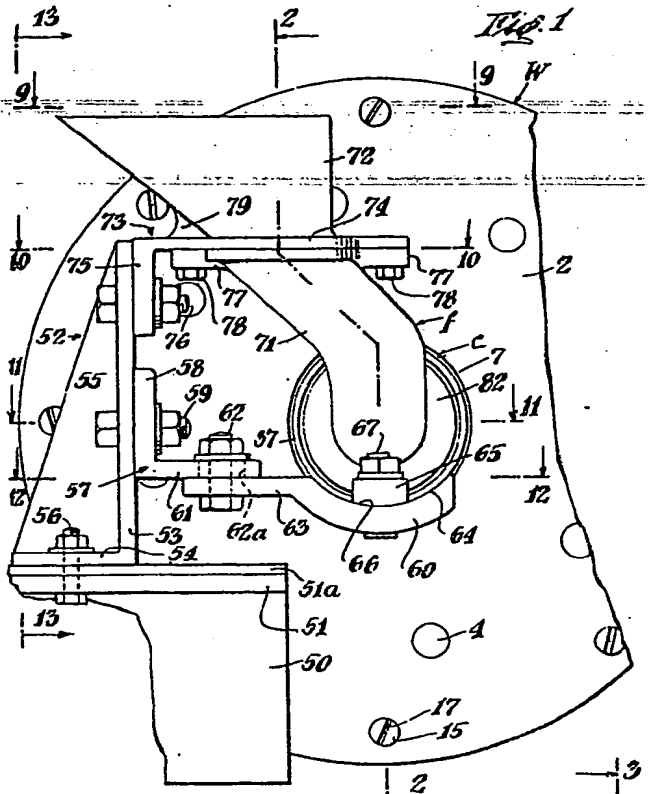


Fig. 2

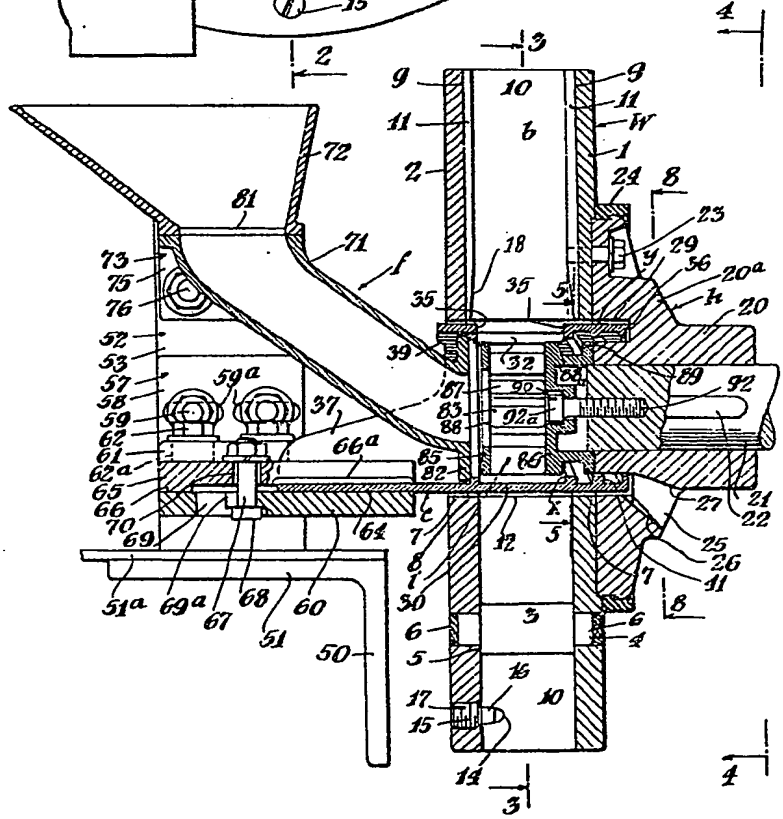


Fig. 3

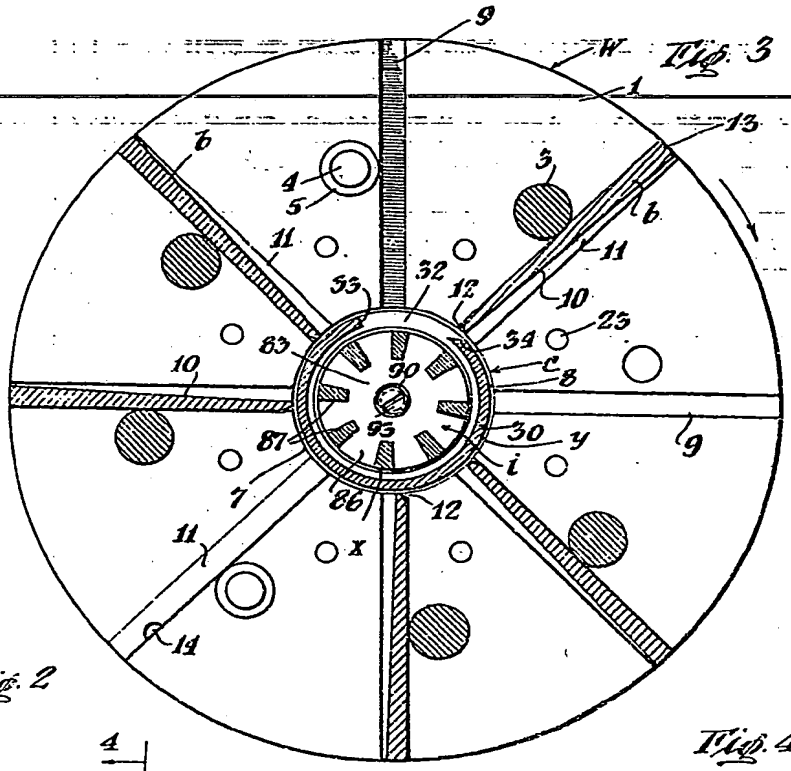


Fig. 2

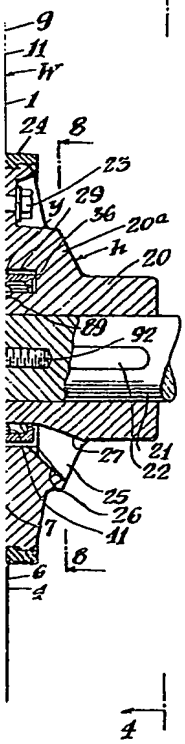
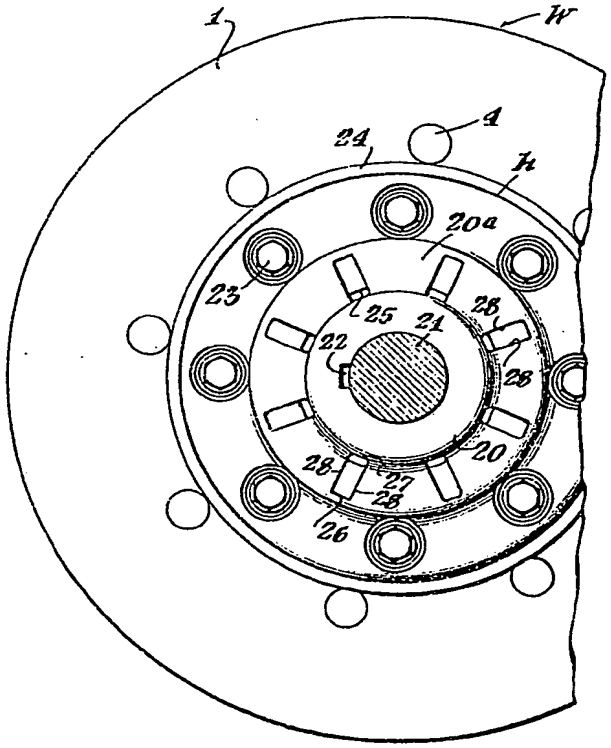


Fig. 4



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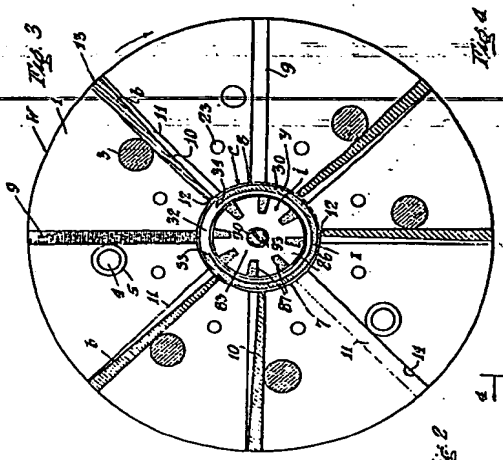
2 SHEETS
SHEET 1



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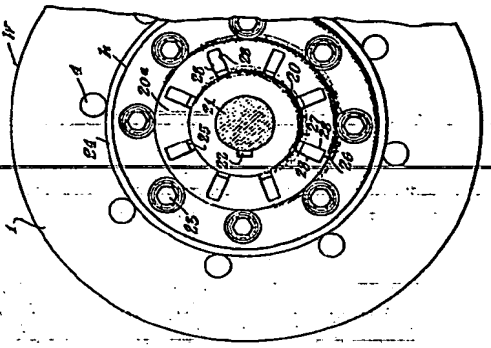

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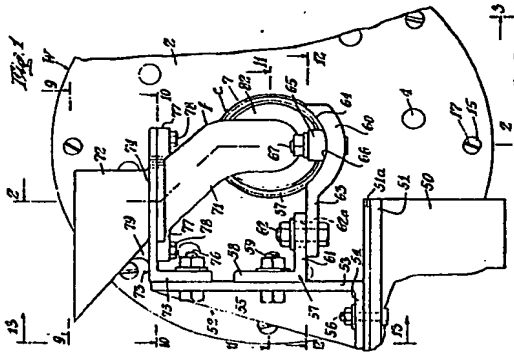

Fig. 1

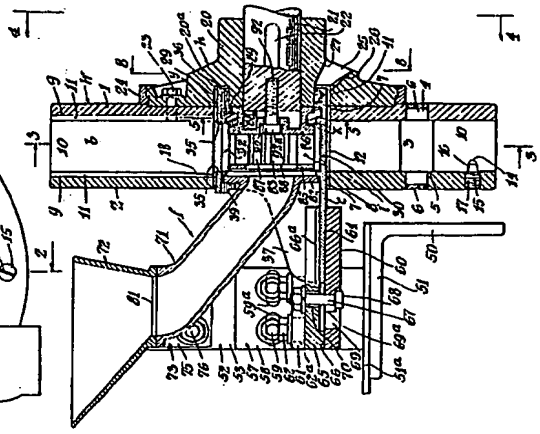

Fig. 2

533,051 COMPLETE SPECIFICATION

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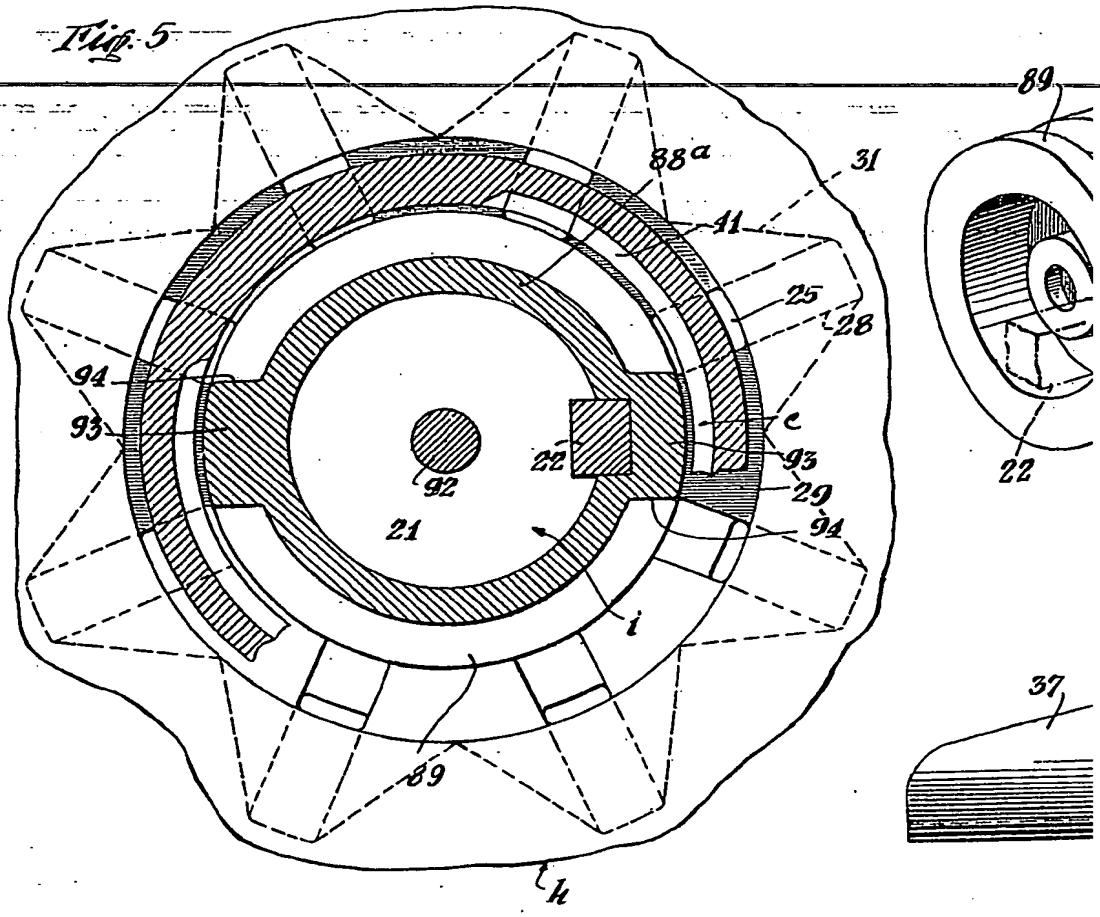
Fig. 5



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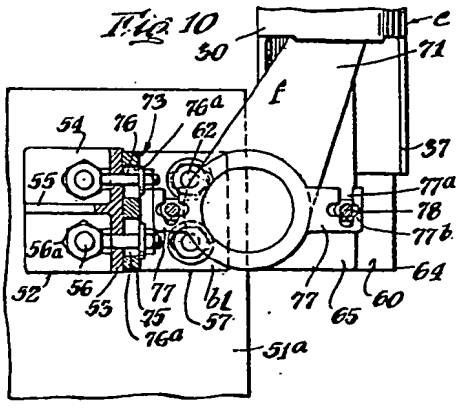

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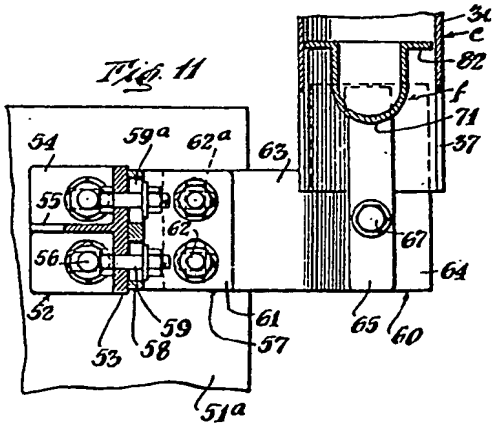

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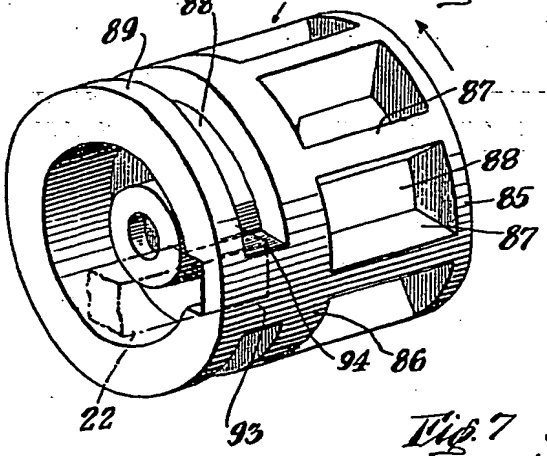

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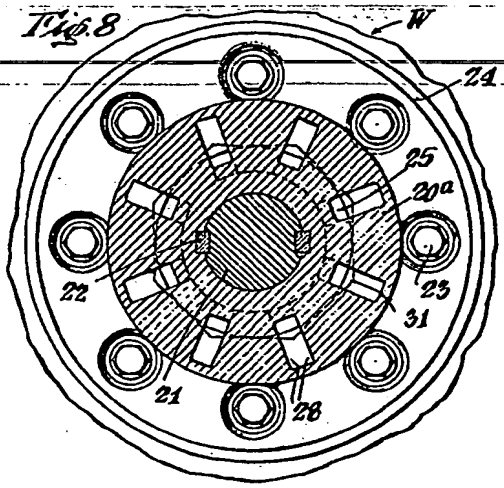
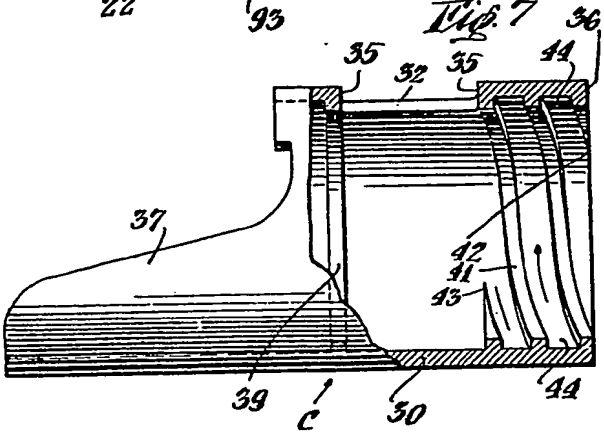


Fig. 7



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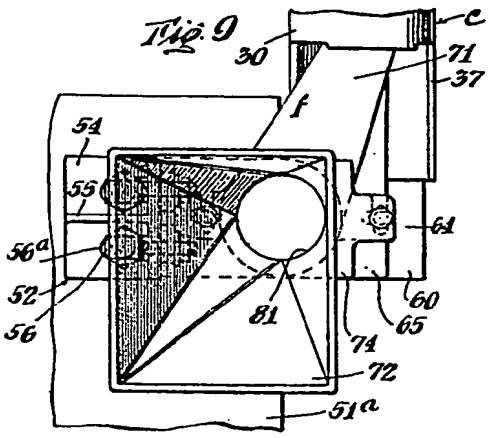

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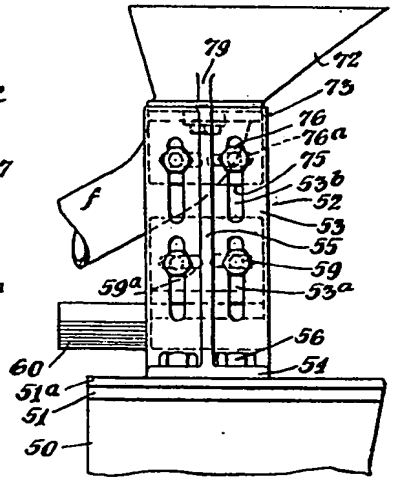

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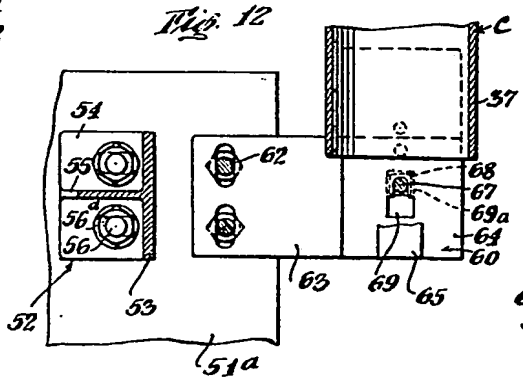

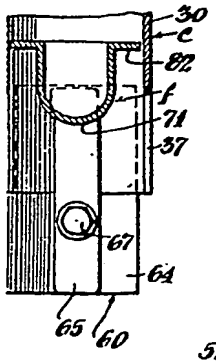

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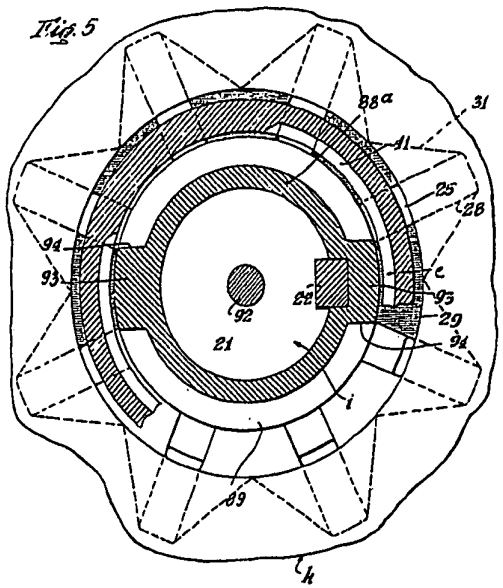
Fig. 5



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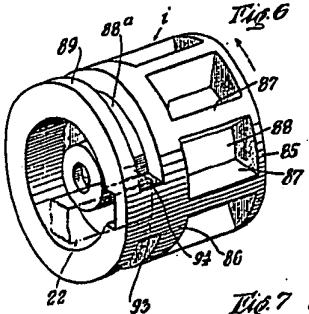

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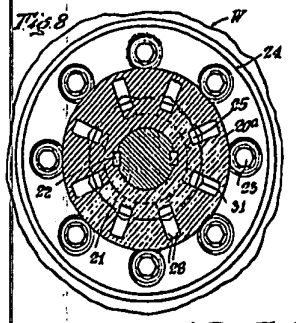

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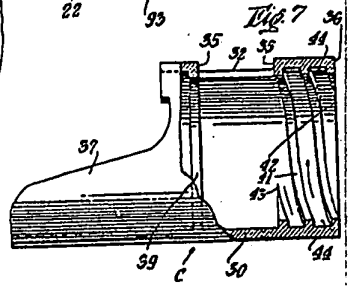

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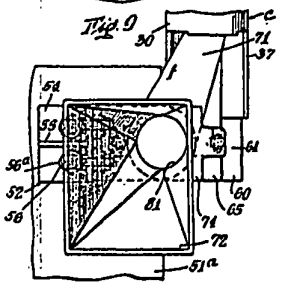

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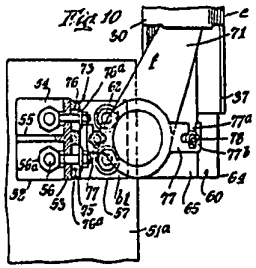

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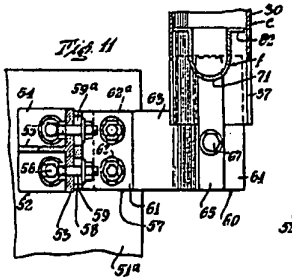

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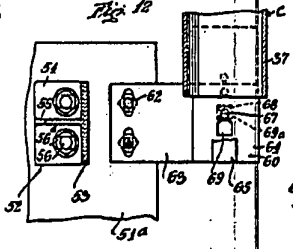

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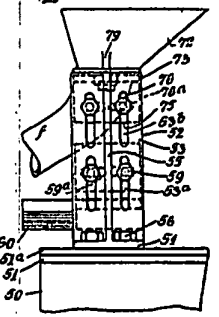

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